least a portion of said certification pattern using the read element in order to allow the integrity of said data area to be checked.

The office action appears to dismiss Applicant's claimed invention as being a mere writing and reading of data (or, more generally, "bits"). Applicant's claimed invention is far more substantive than that. The recited features underlined above are not disclosed in Teo, particularly the fact that the read element reads a portion of the certification pattern that was previously written while at the same time the write element is positioned at least partially over another track (and is therefore ready to write the next portion of the certification pattern that needs to be written).

Applicant's claimed invention of claims 35-37 effectively interleaves the writing of certification data and the reading of certification data. This interleaving occurs during the same revolution of the disk under the read/write elements. It used to require two revolutions of the disk to achieve this (in those prior art arrangements where the certification pattern was written and then read back to be checked during effectively a single process): one revolution was required in order to write the certification pattern, and then a second revolution was required in order to read back the certification pattern that had been previously written. By interleaving the writing and reading, what used to take two revolutions of the disk now only takes one revolution, and therefore the manufacturing time in this respect has been halved. This is a significant step forward in reducing the manufacturing time. This advance was achieved by what is claimed in claim 35 where in particular it is recited that the write element is repositioned at least partially over another track (where it can write the next certification data) while at the same time the read element is reading back the certification pattern that was just previously written by the write element.

This manner of interleaving of the reading and writing of certification data is certainly not disclosed in Teo, and there is no interleaving of this type of reading and writing of any data or bits in Teo. Moreover and importantly, it is directly analogous to the steps in claims 15 and 22 which the examiner stated made those claims allowable where, in those claims, in effect the reading of a logic field of a servo frame is interleaved with the writing of a position field of a servo frame.

Thus, for all of the foregoing reasons, Teo does not disclose all elements of Applicant's claimed invention of claims 35-37, and therefore is not a proper basis for a §102(b) rejection

thereof. Nor is there any disclosure or teaching in Teo that would have suggested Applicant's claimed invention to one of ordinary skill in this art. Thus reconsideration and withdrawal of this rejection, and allowance of claims 35-37 is respectfully requested.

Claim Rejections under 35 U.S.C. §103: Claims 38-47

Applicant's independent claims 38 and 45 recites, inter alia: (1) moving the write element relative to the storage medium to a position over said track such that a second portion of said position field of said servo frame of said track can be written at a position that is at least spaced laterally of the track from said first portion; and (2) during this movement, reading a portion of at least one of (i) said logic field of said servo frame of said track and (ii) a logic field of a servo frame of another track, in order to allow said portion of the logic field to be verified.

First, Applicants wish to draw the Examiner's attention to a serious deficiency in the claims analysis of the current office action. The Examiner provides a discussion as to why claims 35-37 were rejected as allegedly lacking novelty over Teo. The Examiner goes on to discuss why Teo and Zhu allegedly render claims 27-34 and 48-65 as obvious. However, while listing claims 38-47 as being rejected for obviousness, the office action never provides any analysis what so ever as to why claims 38-47 are allegedly obvious over Teo and Zhu.

It is well established that "the examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability. If that burden is met, the burden of coming forward with evidence or argument shifts to the applicant." *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992) (discussing *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984)). By failing to provide any analysis or discussion what so ever as to why claims 38-47 are allegedly obvious over Teo and Zhu, the examiner has failed to meet the initial burden of presenting a *prima facie* case of unpatentability with respect to these claims.

In order to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. (BNA) 580 (C.C.P.A. 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 U.S.P.Q. (BNA) 494, 496 (C.C.P.A. 1970).

Teo discloses a disk drive with optimized read gate delay and a method of writing data to a disk drive. Zhu discloses a system and method for performing a combined media certification and servo data writing function. However, Teo and Zhu, when viewed separately or in combination, clearly do not disclose (1) moving the write element relative to the storage medium to a position over said track such that a second portion of said position field of said servo frame of said track can be written at a position that is at least spaced laterally of the track from said first portion, and (2) during this movement, reading a portion of at least one of (i) said logic field of said servo frame of said track and (ii) a logic field of a servo frame of another track, in order to allow said portion of the logic field to be verified, as recited by Applican's claims 38 and 45. Further, the examiner has failed to cite any portion of either Teo or Zhu that disclose this recited portion of Applicants' claims. Most importantly, the examiner admits that Teo and Zhu fail to disclose this recited portion of claims 38 and 45, as these features were also recited in claims 15 and 22 and formed the basis of allowance of those claims (see page 9 of the current office action).

Thus, for the above cited reasons, Teo and Zhu fail to disclose all of the elements recited in applicants' claimed invention, thereby failing to make Applicant's invention a predictable use of prior art elements. Further, Teo and Zhu fail to provide a basis to establish obviousness under additional rationales, including simple substitution for one known element for another to obtain predictable results, use of known technique to improve similar devise in the same way, applying a known technique to a known device ready for improvement to yield predictable results, obvious to try, and the presence of a teaching, motivation, or suggestion. Thus, reconsideration and withdrawal from this rejection, and allowance of claims 38-47 is respectfully requested.

Claim Rejections under 35 U.S.C. §103: Claims 27-34 and 48-65

Independent claims 27, 32, 48, 51, 52 and 59 recite, *inter alia*, that the position field of a servo frame is written in two distinct writing steps: by (1) writing a first portion of the position field, moving the write element, and then (2) writing a second portion of the position field.

Teo discloses the PLL field is written in one single step, and not written in two portions. Teo's PLL field 28, which in any event is a timing field of user data (and not a position field of a servo frame as claimed), is written in one single step. Thus, Teo does not disclose writing a position field of a servo frame in two distinct steps, as recited by Applicant.

In rejecting these claims (for example, claim 27), the examiner equates the claimed "first portion of a position field [of a servo frame]" with the PLL field 28 of Teo (which, as we have said, is not correct because the PLL field 28 of Teo is a timing field and is for the user data not the servo frame) and then equates the claimed "second portion of said servo frame" with the user data of Teo (but user data is not and cannot be a position field or part of a position field of a servo frame). With respect to the examiner, this objection is plainly not based on a correct reading of the current claims or the prior art.

Zhu does not disclose what is missing in Teo. Zhu discloses a system and method for performing a combined media certification and servo data writing function, but not the writing of position fields of servo frames in two distinct steps, as recited by Applicant.

Thus, for the above cited reasons, Teo and Zhu fail to disclose all of the elements recited in Applicants' claimed invention, thereby failing to make Applicants' invention a predictable use of prior art elements. Further, Teo and Zhu fail to provide a basis to establish obviousness under additional rationales, including simple substitution for one known element for another to obtain predictable results, use of known technique to improve similar devise in the same way, applying a known technique to a known device ready for improvement to yield predictable results, obvious to try, and the presence of a teaching, motivation, or suggestion. Thus, reconsideration and withdrawal from this rejection, and allowance of claims 27-34 and 48-65 is respectfully requested.

BACKGROUND ON SERVO FRAMES AND MEDIA CERTIFICATION

Historically, during manufacture of a hard disk, servo frames are written to the hard disk on a one-off basis in a very complex machine known as a servo-track writer. The servo frames are effectively permanently recorded on the disk and are never erased or deleted or rewritten or amended during use by an end user. The servo frames provide the master reference that is used by the disk drive during normal operation in order to locate the tracks and sectors on the disk for data storage and retrieval. Clearly, the servo frames have to be accurately written to the disk at very well defined positions. Currently, it takes over 35 minutes to write the complete set of servo frames to a typical disk. (See Applicant's specification at paragraph [0006]).

It is highly desirable, and indeed practically necessary, to "verify" the servo frames, i.e. to check that they have been written correctly by the servo-track writer. Historically, this has

had to be done after all of the servo frames have been written, which adds significantly to the time involved for manufacture of the hard disk. Also, because of the time involved to read back and verify the servo frames, this has typically only been carried out in respect of a small sample of the servo frames, which clearly has limitations. The terms "verifying" or "verification" or similar as used in this patent application are well known and understood in this field and are to be taken to include at least pattern recognition, position demodulation, amplitude grading, timing recovery and certification. Which of these is relevant will depend on the purpose for which the data is being read, as will be well understood by a person skilled in the art. (See Applicant's specification at paragraphs [0007, 0008, 0098]).

It is also highly desirable, and indeed practically necessary, to "certify", the disk, i.e. to check the data areas of the disk for defects, such as surface defects, substrate defects, mechanical scratches, etc. At present, this is carried out on a separate media certification machine prior to the servo writing process and, in a typical example, takes an additional 15 minutes or so to check the whole of the data areas. Bearing in mind that the disk has to be physically moved from the media certifier to the servo track or media level writer, a complete media certification process would add some 50% to the processing time required to prepare the disk. This is obviously undesirable. Again, this may be carried out in practice only for a portion of the disk, which is undesirable. (See Applicant's specification at paragraph [0010]).

In essence, in aspects, the present invention interleaves reading and writing of (specific) parts of the servo frames so that the servo frames can be verified during the servo frame writing process. In other words, in simple terms, the servo frames are written and checked at the same time. This presents a very significant saving in time. Instead of first having to write all of the servo frames and only then subsequently reading them back to verify them, these two significant and time-consuming processes (writing and verifying) can be carried out in tandem and practically simultaneously.

For example, in one aspect, the writing of at least a portion of a position field of a servo frame to a track of a storage medium is interleaved with reading of at least a portion of a previously written logic field of a servo frame of a track of the storage medium. This allows that portion of the previously written logic field to be verified during the servo writing process. This interleaving allows the logic fields to be verified (i.e. checked) on-the-fly during the servo writing process, without any additional processing time being required. Other advantages, such

as reduced heat build-up and better integrity of the logic fields, can arise, depending on the precise implementation in a practical product. (See Applicant's specification at paragraphs [0011,0012,0013])

Servo frames are well known and understood in this field. A servo frame has two distinct portions, a logic field and a position field. (See Applicant's specification at paragraph [0107]).

The position fields are used when the hard disk is in use by an end user to allow the read and write heads to position themselves correctly over the essentially circular tracks on the hard disk as the hard disk spins under the heads. In essence, the position fields allow the read and write heads to stay "on track" and to stop the heads wandering off the tracks. The precise structure of the position field is unimportant and can be for example quadrature, bi-phase, or phase encoded, as well as full track and half track bursts, which will be well known to persons skilled in the art. (See Applicant's specification at paragraph [0107]).

The logic fields are again used when the hard disk is in use by an end user. In simple terms, the logic fields allow the disk drive to determine which of the tracks on the disk the heads are currently positioned over and, more specifically, precisely which portion of which track the heads are currently positioned over, so that the disk drive can read from and write to the correct portions of the hard disk in order for example to write data or read back specific data as required continuously in end use by a computer's operating system or applications or other programs running on the computer. The logic fields also contain information so that the disk drive can know what frequency was used to store the information in the logic fields so that the information can be correctly read during end use. The logic fields include at least an address mark that provides a unique timing reference for the servo frame and that sets the absolute timing for the servo frame. Preferably, the logic field also includes a timing field (a "PLL field") which is used to lock a phase locked loop (PLL) of the servo mechanism of the hard disk drive when in use by an end user. The logic field also preferably includes a gray code field which is used to provide a track address when the hard disk drive is used by an end user. The address mark can be used to generate timing windows to read the gray code. (See Applicant's specification at paragraph [0108]).

So, in summary and in simple terms on servo frames on hard disks, these are written once and once only during manufacture and are never amended or deleted or rewritten during end use (even during disk formatting for example). Servo frames have position fields and logic fields.

The position fields allow the read and write heads of the disk drive to stay on track. The logic fields contain information that is used by the disk drive in end use to know how to read the servo frames correctly and where over the disk the read and write heads are located.

TEO CANNOT BE APPLIED AS PRIOR ART TO SERVO FRAMES OR MEDIA CERTIFICATION

With respect to obviousness, *Graham v. Deere* dictates that *first* the scope and content of the prior art must be determined 383 U.S. 1 (1966). This includes determining what constitutes *analogous* art. If a reference is determined not to constitute analogous art, it can not be further considered in the obviousness analysis.

A two step test has been developed to determine whether a particular reference is within the appropriate scope of the prior art. First, it must be determined whether a particular reference is "within the field of the inventor's endeavor." Second, assuming the reference is outside that field, it must be determined whether the reference is "reasonably pertinent to the particular problem with which the inventor was involved." *In re Deminski*, 796 F.2d 436, 230 U.S.P.Q. (BNA) 313, 315 (Fed. Cir. 1986).

Teo is not within the field of the inventor's endeavor as required by *In re Deminksi*. Teo (US-A-2003/0002190) does not disclose servo-track writing, or verifying of servo frames, or media certification, at all. Teo is concerned with something completely different. Inevitably, there is some common language used in Teo and the description and claims of the present application, but that is simply because the apparatus of US-A-2003/0002190 is a hard disk drive, which therefore uses servo frames to position the read/write head over tracks on the hard disk. Further, Teo is not reasonably pertinent to the particular problem with which the inventor was involved. Applicant's claims are directed toward how to manufacture a blank magnetic disk to have servo frames and certification of the disk. In direct contrast, Teo discloses how to write data on a manufactured disk that already includes servo frames and that will have been certified. One cannot write data on a disk that is not manufactured to have servo frames. Servo frames are part of the disk's structure that is created during the manufacturing process that enable the disk to store data. (Teo discusses for example servo systems in modern disk drive architectures from paragraph [0054] onwards and refers to the data tracks being "divided into a number of data sectors... In addition, associated with the data sectors are a series of servo frames..." and then

says at the beginning of paragraph [0060] "the sequence of events in writing data to a data sector following a servo frame will be described".) Teo is not concerned with writing servo frames at all, nor of certifying the disk. It is concerned solely with problems that might arise during normal writing and reading of user data using a disk that has already been completely manufactured. Clearly, Teo fails to meet the *In re Deminski* test and cannot be considered in any obviousness analysis with respect to Applicant's claims.

What Teo is concerned with and discloses is this. During normal use by an end user, the controller of a disk drive has to switch the read/write heads between reading and writing modes. As discussed from paragraph [0060] onwards of Teo, a predetermined delay between reading and writing is built in, which allows for the fact that the read and write elements of the head are separated by a distance L (as well as to allow the electronics to settle when switching between read mode and write mode). As discussed particularly from paragraph [0066] of Teo onwards, it is a fact that the distance L between the read and write elements vary between hard disk drives owing to variations in tolerances during manufacture. The invention of US-A-2003/0002190 effectively tweaks the delay on the read gate during normal read/write operations in order to compensate for this non-uniform separation L between different disk drives and thereby reduce the number and frequency of errors that can otherwise occur when a disk drive is in normal end use by an end user reading and writing data.

This however has nothing to do with the invention as claimed in its various aspects in the present application. Contrary to the examiner's assertions, Teo does not disclose , *inter alia*, the writing of servo frames or the writing of certification patterns as required by the respective independent claims of the present application. The apparatus in Teo is not a servo track writer, does not carry out verification of fields of servo frames, and does not carry out certification of the medium (the disk surface). Each independent claim in the present application clearly includes at least either the feature of (i) writing a field of a servo frame or (ii) writing a certification pattern to a data area of a track (or is apparatus arranged to do such steps) and, at least because of these distinctions, each independent claim is clearly novel over the prior art cited by the examiner. There is furthermore no suggestion in the prior art document cited by the examiner of the significant interleaving concept as claimed in the independent claims of the present application and discussed more fully above, such that each independent claim defines inventive subject matter.

The examiner is mistakenly reading some parts of some independent claims onto some of the disclosure in Teo.

For example, for claims 35 and 37, Teo does not write a certification pattern to a data area of one track with a write element (step B of claim 35), then reposition the write element to be positioned at least partially over another track on the storage medium (Step C of claim 35), and, while the write element is positioned at least partially over that other track, read at least a portion of the certification pattern written to the first track (Step D of claim 35). In rejecting these claims, the examiner has referred to paragraphs 0007, 0008, 0009 and 0011 and Figure 8 of Teo. However, as even quoted in part by the examiner, those paragraphs and figure merely say "writing a bit pattern to the track", "reading the bit pattern…", "calculating [not "checking" as referred to by the examiner] a read bit error rate…", "determining the optimal read gate delay duration for each track of the hard disk drive". There is simply no disclosure of "writing a certification pattern", "reading a certification pattern", or "repositioning the write element to be (at least partially) over another track and, while the write element is positioned at least partially over that other track, reading at least a portion of the certification pattern written to the first track".

As another example, for claims, 27, 32, 48, 51, 52 and 59, the examiner is still equating the claimed position field of a servo frame with Teo's PLL field (which is a timing field, not a position field; see the discussion of position fields and logic fields in servo frames give above) of the user data. As is well known by those skilled in this art, the user data on a disk drive has its own timing fields (referred to in Teo as "PLL fields" because it uses a well known feature of phase locked loops to lock the frequency or "timing" in a type of feedback mechanism). But a timing field is not a position field as claimed in these claims, and the timing fields of Teo are for the user data and not of the servo frames. Teo cannot possibly be said to anticipate these claims.

Also, the relevant claims require in essence that the position field is written in two distinct writing steps, by writing a first portion of the position field, moving the write element, and then writing a second portion of the position field. In rejecting these claims (for example, claim 27), the examiner equates the claimed "first portion of a position field [of a servo frame]" with the PLL field 28 of Teo (which, as we have said, is not correct because the PLL field 28 of Teo is a timing field and is for the user data not the servo frame) and then equates the claimed

"second portion of said servo frame" with the user data of Teo (but user data is not and cannot be a position field or part of a position field of a servo frame).

In short, Teo discloses nothing like what is claimed in the present application and also cannot be said to render obvious anything that is claimed in the present application. Teo is concerned solely with optimising operation of a disk drive during end use by an end user to compensate for mechanical variations that arise during manufacture of the read and write heads of the disk drives. The present invention as claimed in various aspects is concerned with writing and reading of servo frames and the writing and reading of certification patterns in new and non-obvious ways by interleaving various reading and writing steps during manufacture of the disk drive which allows the servo frames to be verified practically simultaneously with the writing of the servo frames and/or the disk surface to be certified by writing and reading a certification pattern to the disk practically simultaneously. In examples prior to the present invention, servo frame writing for a single disk could take 35 minutes, the verification could take a similar amount of time if carried out for all of the servo frames (which, as noted above, in practice was not done) and the media certification could take an additional 15 or 20 minutes. The present invention allows verification of all of the servo frames and certification of practically the whole of the disk surface to be carried out during the 35 minutes that is taken for the servo frames to be written. Given that time is money, and considering the enormous volume of disk drives that are manufactured *on a daily basis*, this invention is a major and substantial advance in the manufacture of disk drives. It should also be borne in mind that disk drive capacity has increased enormously in the last 10 to 20 years (because of other advances), meaning that the number of servo frames that are present and that need to be verified and the data storage area have also increased enormously.

CONCLUSION

All matters having been addressed and in view of the foregoing, Applicant respectfully requests the entry of this paper, the Examiner's reconsideration of this application, and the immediate allowance of all pending claims.

Applicant's representative remains ready to assist the Examiner in any way to facilitate and expedite the prosecution of this matter. If any point remains in issue which the Examiner

feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975 (Ref. No. 011765-0307460). The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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